REMARKS

Claims 1-9, as amended, remain in the case.

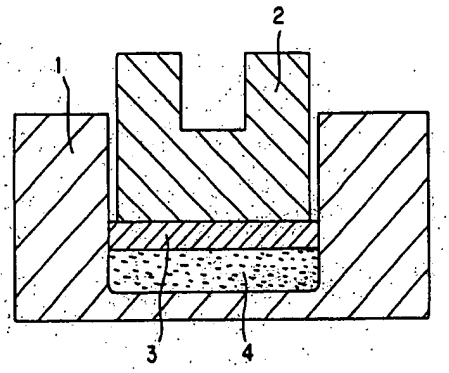
1. The specification is amended on the first page to give the patent number of the allowed parent application. Reference to the Japanese patent application on page 10 is amended to provide, as a convenience to the reader, the patent number of the U.S. equivalent. The foreign priority application for this Makino et al. patent is 10-052971 as cited on page 10 of the specification.

Claim 1 is amended to use paragraphing to set out the three alternative embodiments in the initial part of the claim and to add the word "or" between the first and second embodiments. Other minor stylistic changes have been made as well.

2. Claims 1, 2, and 5-8 were rejected under 35 U.S.C. 103(a) as unpatentable over Ohmae et al (USPN 4,624,404) in view of Ushikoshi et al (USPN 6,057,513). This rejection is traversed.

The species elected for examination is illustrated in Fig. 1, copied below:

FIG. 1



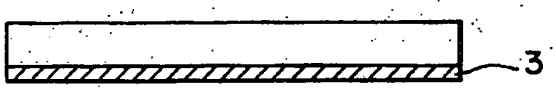
The related text at page 10, lines 12-27, of the specification reads:

> A method for bonding different members through a fitting structure which comprises uniformly spreading a fine particle material (4) over the surface of a dented portion of a member (1) having the dented portion, then disposing a platy or powdery hard solder (3) so as to cover at least a part of the layer comprising the fine particle material, further disposing a member (2) having a protruded portion, heating them to a given temperature under application of pressure to melt the hard solder and impregnate the fine particle material with this molten hard solder to form a bonding layer of an adhesive composition comprising the hard solder and the fine particle material. In this case, a mixture of the fine particle material and the powdery hard solder may be used in place of the layer comprising the fine particle material and the platy or powdery hard solder which covers said layer.

Ohmae et al. makes a brazed product of a ceramic and metal layer by a process different from the one discussed above.

Ohmae et al. first makes a coating on a ceramic base with an insert

FIG. 1(b)



Top (1): Si_3N_4 or SiC ceramic

3: insert material such as NiO + Ni or Cu_2O + Cu

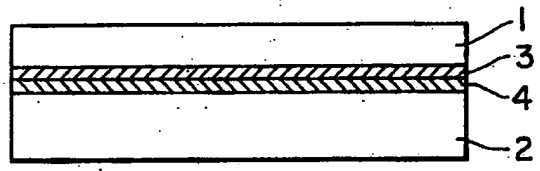
material which is deposited on the ceramic layer 1 by ion plating or spray coating as illustrated in Fig. 1(a), which is identical in appearance to Fig. 1(b) copied above; see the related description at col. 2, lines 42-55.

The insert materials are described at col. 2, lines 5-12, which includes a listing of various examples of the composite material. Then a thermal reaction-promoting treatment or processing is given to the plating or coating as illustrated in Fig. 1(b) and described in col. 2, lines 55-57. The purpose of this required treatment is understood by reading col. 2, lines 16-18, which informs one that "strong bonding is ensured by the thermal reaction-promoting treatment or processing." Such a thermal reaction-promoting treatment or processing is not employed in applicants' process.

#1

In the Ohmae et al. final step, the metal layer 2 is brazed to the insert material coated ceramic layer, which has been thermally treated, to bond the two ceramic and metal layers together as illustrated in Fig. 1(c), copied below.

FIG. 1(c)



1: ceramic layer

3: insert material

4: brazing or soldering material

2: metal layer

The Ohmae et al. process does not cause the fine particles to be present when the ceramic and metal layers are being bonded because any "fine particles" in the deposited insert layer may well have been melted and uniformly bonded to the ceramic during the thermal reaction-promoting treatment or processing. #3

In summary, in the Ohmae et al. process, the insert material layer (3) formation and the brazing material layer (4) formation are carried out sequentially, as clearly indicated in claim 1 of the reference. In the present invention, on the other hand, the bonding layer is formed by heating, as defined in the final step of instant claim 1. As such, the insert material layer and the brazing layer are formed as respective

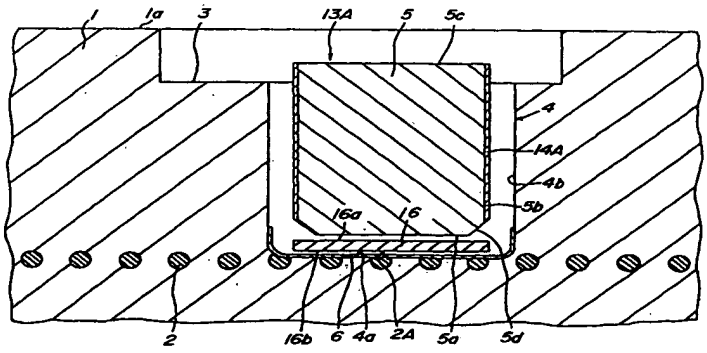
independent layers in the Ohmae et al. process. However, in the present invention, the bonding layer comprising fine particles and the hard solder is formed as an integrated layer, the layer serving both as a buffer layer for thermal stress and as a bonding layer.

#3

The Examiner notes Ohmae et al. does not teach a method for bonding ceramics and metals including a member having a dented portion and a member having a protruded portion.

Ushikoshi et al. is cited to show that the artisan aware of bonding a ceramic member having a dented portion and a metallic member having a protruded portion with an electrically conductive member (brazing material) disposed between them. The structure before bonding is illustrated below - reproduced Fig. 3.

FIG_3



The U-shaped ceramic material is 1, the metallic member is 5, the brazing material is 16, and the metallic foil is 6. The invention involves using a coating layer 14a along the sides of the metallic member to prevent the brazing material when molten from creeping up the sides of the metallic member. In col. 4, lines 29-30, the material 16 is described as "the electrically conductive joint material 16 such as brazing material or the like."

In the loading of temperature differences, such as in thermal cycle testing, for a bonded body, the invention disclosed by Ushikoshi et al. can not reduce the risk of cracks in ceramics or the interface of ceramics/hard solder caused by thermal stress induced by the CTE differences, due to the use of the material as an additive for the solder brazing material; see col. 7, lines 19 to 61. The presently claimed invention, on the other hand, achieves a reduction of the risk because of the low CTE of the solder; see page 6, line 7 to page 8, line 11 of the specification.

There is no proper suggestion or motivation to combine these two references because Ohmae et al. relates to bonding flat layers where an initial thermal treatment is carried out on

the insert material coated on the ceramic layer before the metal layer is bonded. Ushikoshi et al uses a one-shot process where the brazing material 16 and the metal foil 6 melt at the same time to fuse the ceramic material 1 to the metallic member 5.

According, review and withdrawal of this rejection are requested.

3. Claim 9 was rejected under 35 U.S.C. 103(a) as unpatentable over Ohmae et al. in view of Ushikoshi et al. as applied to claim 1 above, and further in view of Makino et al. (USPN 6,390,354). This rejection is traversed.

Claim 9 relates to the method of claim 1 where the fine particle material is formed of ceramic fine particles having their surface coated with a metal by plating or sputtering.

As discussed above in Section 2, the basic method of claim 1 is not taught or suggested by the two primary references.

Makino et al. and the present case have a common inventor, Masayuki Shinkai. The Examiner notes Makino et al. constitutes prior art only under 35 U.S.C. 102(e). The Examiner also notes:

> For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made,

owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Both Makino et al. (USPN 6,390,354) and the parent of this divisional application, now USPN 6,348,273, are commonly assigned to NGK Insulators, Ltd as noted on each of the patents. Since this divisional application was filed after November 29, 1999, under the provision quoted above by the Examiner, Makino et al. is not prior art here.

Accordingly, review and withdrawal of this rejection are requested.

4. Claims 1, 3, and 5-8 are rejected under 35 U.S.C. 103(a) as unpatentable over Ohmae et al. (USPN 4,624,404) in view of Do-Thoi et al. (USPN 5,525,432). This rejection is traversed.

Claim 3 is directed to a second embodiment illustrated in Fig. 2 where the protruding portion has one or more holes for insertion of the hard solder.

Ohmae et al. is discussed in Section 2 above. In that technique, fine particles are not present when the ceramic and metal layers are being bonded because the fine particles in the

deposited insert layer are melted and uniformly bonded to the ceramic during the thermal reaction-promoting treatment or processing.

The Examiner also notes that Ohmae et al. does not teach a method for bonding ceramics and metals including a member having a dented portion and a member having a protruded portion.

Do-Thoi et al. relates to internal soldering in metal/ceramic composites. Fig. 1 of that reference is reproduced below.

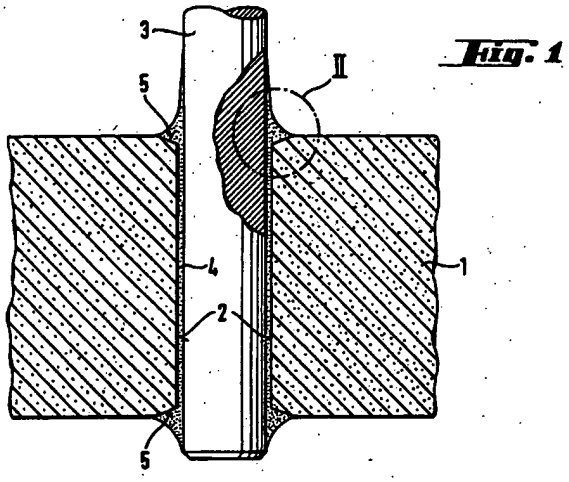


Fig. 1

Contrary to the discussion thereof in the Office Action, it appears that ceramic member 1 has the "dented" portion with hole 2 and metal pin 3 is the "protruded" portion which fits into that hole. The passages in col. 3, lines 10-15, and col. 4, lines 20-25, inform one that the metal pin is coated with a

solder material and inserted in the hole 2 and the assembly is heated to melt the solder and join the metal pin and the ceramic material 1.

Do-Thoi et al. does not teach having the protruding pin portion with at least one hole where the hard solder is inserted. The patent also does not teach having the dented ceramic layer portion with a layer of fine particles before the bonding step.

Accordingly, review and withdrawal of this rejection are requested.

5. Claim 9 was rejected under 35 U.S.C. 103(a) as unpatentable over Ohmae et al. in view of Do-Thai et al. as applied to claim 1 above, and further in view of Makino et al. (USPN 6,390,354). This rejection is traversed.

The deficiencies of the combination of the two primary references are discussed above in Section 4.

Makino et al. was discussed in Section 3. In view of the common ownership of Makino et al. and this application, under the provision quoted above in Section 3 by the Examiner, Makino et al. is not de jure prior art in a Section 103(a) rejection.

Accordingly, review and withdrawal of this rejection are requested.

6. Claims 1 and 4-9 were rejected under 35 U.S.C. 103(a) as obvious over Ushikashi et al. (USPN 6,057,513) in view of Makino et al. (USPN 6,390,354). This rejection is traversed.

Claim 4 is directed to the third embodiment of the invention illustrated in Fig. 3.

The Examiner admits Ushikoshi et al. does not teach a method including a step of previously preparing a member having a protruded portion, the end of which has a layer comprising a hard solder and a fine particle material, wherein the fine particle material reduces thermal stress and is ceramic, cermet, low-expansion metal fine particles, or ceramic fine particles coated with a metal by plating or sputtering.

Makino et al. is cited to teach this concept. The reference, for the reasons given above, is not de jure prior art.

Accordingly, review and withdrawal of this rejection are requested.

Applicants respectfully submit that the present application is now in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for all pending claims.

Should the Examiner deem that any further action by the applicants would be desirable for placing this application in even better condition for issue, she is requested to telephone applicants' undersigned representative at the number listed below.

Respectfully submitted,

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June 23, 2003
Date

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